

GEOMORPHOLOGY

Project title: Holocene and Modern Geomorphic Response to Fires, Floods, and Climate Change in Yellowstone National Park; Natural and Anthropogenic Influences on Stream Systems

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Objective: The current primary objective is to understand the combined influences of Holocene climatic and hydrologic change, forest fires, vegetation change, and beaver activity on small streams in northern Yellowstone. In concert with other paleoenvironmental studies, detailed geomorphic and stratigraphic analysis of fluvial and beaver dam sediments along with radiocarbon dating will shed light on intrinsic and climatic controls on stream systems and the long-term influence of beaver on valley floor environments of Yellowstone's northern range.

Findings: A stratigraphic section was examined in mixed beaver pond and fluvial sediments along Elk Creek just east of the Mammoth–Tower road. From 230 to 155 cm Departmenth, a silty clay to sandy, organic-rich, strongly gleyed unit suggests deposition in a beaver pond to marsh environment. A small charcoal fragment near the base of this unit dated 3560 ± 170 C-14 yr BP, and a conifer cone from near the top dated 1136 ± 49 C-14 yr BP. Sharply overlying this unit from a Departmenth of 155 to 123 cm is pebble gravel overlain by coarse pebbly sand, probably stream alluvium. From 123 to 95 cm, more bedded sediments generally fine upward into a very fine, sandy organic-rich unit with a charred twig dating 336 ± 49 C-14 yr BP. The top ~113 cm contains several thinner units, typically thin-bedded to laminated fine sand and silt, locally organic rich. Sediments above 123 cm Departmenth are interpreted as primarily beaver pond filling sediments with intermittent flood-deposited clean sands, notably a wavy-laminated sand with stoss-side preservation of bedforms from 95–79 cm Departmenth, and with some charcoal-rich units suggesting fire-induced sedimentation. Overall, the preliminary dating and interpretation of this section indicates beaver pond or marsh sedimentation for the majority of the last 3,800 calendar years, but broken by an episode of coarse fluvial deposition sometime shortly after 1,000 cal yr BP and before 330 cal yr BP. These dates bracketing high-energy deposition also contain the Medieval Warm Period of about 700–1,000 cal yr BP, but further dating is necessary to check for age errors stemming from reworked organic materials, more closely estimate ages of individual depositional events, and infer any climatic associations.